Application No. 10/064,160
Attorney Docket No. 33-XZ-121612 (13494US02)

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently amended) A medical diagnostic imaging system, comprising:

a C-arm unit having an x-ray source for generating x-rays and a receptor for obtaining image exposures from received x-rays, said C-arm unit moving said x-ray source and receptor along an image acquisition path between at least first and second exposure positions, said C-arm unit rotating about a central axis;

x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving at least one of said x-ray source and receptor in a radial direction toward and away from said central axis of the C-arm unit to maintain a desired distance between ~~a patient and said at least one of~~ said x-ray source and receptor;

an image processor collecting a series of image exposures from said receptor including at least first and second image exposures obtained while said x-ray source and receptor are located at said at least first and second exposure positions, respectively, said image processor collecting position data for multiple exposure positions corresponding to said series of image exposures, said image processor constructing a three dimensional (3D) volumetric data set based on said series of image exposures and said position data for said multiple exposure positions; and

a display displaying images based on said 3D volumetric data set.

2. (Original) The medical diagnostic imaging system of claim 1, further comprising a mainframe rotating said x-ray source and receptor to a first scan angle and radially moving said x-ray source and receptor to x-ray source and receptor radial distances, respectively, said x-ray source and receptor radial distances being different from one another and corresponding to distances from said central axis to said x-ray source and receptor, respectively.

3. (Original) The medical diagnostic imaging system of claim 1, further comprising a control panel for setting maximum and minimum radial distances relative to said central axis for at least one of said receptor and x-ray source.

4. (Original) The medical diagnostic imaging system of claim 1, further comprising a tracking subsystem receiving coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, said x-ray source and receptor moving in a radial direction relative to said central axis based on said coordinate data while said x-ray source and receptor are located at said at least first and second exposure positions.

5. (Original) The medical diagnostic imaging system of claim 1, said receptor further comprising at least one sensor detecting a radial position of said receptor relative to a patient surface.

6. (Original) The medical diagnostic imaging system of claim 1, further comprising a mainframe calculating a plurality of radial distances relative to said central axis for each of said receptor and x-ray source, each radial distance of said plurality of radial distances associated with an image exposure in said series of image exposures.

7. (Original) The medical diagnostic imaging system of claim 1, further comprising a mainframe receiving x-ray source position data indicative of a distance between a patient surface and said x-ray source from a first sensor attached to said x-ray source bracket and receptor position data indicative of a distance between said receptor and a patient surface from a second sensor attached to said receptor bracket, said mainframe moving said x-ray source and receptor radially relative to said central axis based on said x-ray source and receptor position data.

8. (Original) The medical diagnostic imaging system of claim 1, further comprising a tracking subsystem receiving coordinate data representative of a patient surface from at least one sensor mounted on said receptor, said tracking subsystem setting a receptor radial distance relative to said central axis based on said coordinate data.

9. (Currently amended) A method for acquiring multiple x-ray images utilized to reconstruct a three dimensional (3D) volume of patient information, the method comprising:

rotating an x-ray source and receptor about a central axis between at least first and second scan angles, said central axis corresponding to a region of interest in a patient;

radially moving at least one of the x-ray source and receptor to first radial distances from said central axis when at said first scan angle and radially moving the at least one of the x-ray source and receptor to second radial distances from said central axis when at said second scan angle,

wherein a desired distance is maintained between said x-ray source and receptor at said first radial distances and said second radial distances;

acquiring at least first and second images at said at least first and second scan angles; and

constructing a three dimensional (3D) volumetric data set based on said at least first and second images.

10. (Original) The method of claim 9, the radially moving step further comprising defining a radial distance from said central axis to the receptor based on a radial distance from said central axis to a patient surface.

11. (Original) The method of claim 9, the radially moving step further comprising:

defining maximum and minimum radial distances relative to said central axis for the at least one of the x-ray source and receptor; and

calculating intermediate radial distances corresponding to said at least first and second scan angles for the x-ray source and receptor based on said maximum and minimum radial distances.

12. (Original) The method of claim 9, the radially moving step further comprising detecting coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, to define said first and second radial distances.

13. (Original) The method of claim 9, the radially moving step further comprising:

determining said first radial distance for the receptor relative to said central axis by radially moving the receptor towards a patient surface until receiving a sensor signal indicating a predefined distance between the receptor and the patient surface; and

calculating said second radial distance for the x-ray source relative to said central axis based on said first radial distance for the receptor.

14. (Original) The method of claim 9, the radially moving step further comprising defining maximum and minimum radial distances relative to said central axis for the at least one of the x-ray source and receptor.

15. (Original) The method of claim 9, the radially moving step further comprising:

radially moving the receptor to said first radial distance relative to said central axis based on at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively; and

radially moving the x-ray source to maintain a predetermined distance between the receptor and x-ray source.

16. (Currently amended) An x-ray apparatus for acquiring x-ray images and reconstructing three dimensional (3D) volumes of patient information, comprising:

a C-arm unit having an x-ray source for generating x-rays and a receptor for obtaining image exposures from received x-rays, said C-arm unit moving said x-ray source and receptor along an image acquisition path between a series of exposure positions, said C-arm unit having a central axis corresponding to a region of interest in a patient, said C-arm unit rotating about said central axis;

x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving at least one of said x-ray source and receptor in a radial direction toward and away from said central axis of the C-arm unit to maintain a desired distance between ~~a patient and said at least one of~~ said x-ray source and receptor;

a data processor tracking component coordinate data based on at least one of a distance between said central axis and one of said receptor, said x-ray source, and a patient;

an image processor collecting a series of image exposures from said receptor obtained while said x-ray source and receptor are located at said series of exposure positions, said image processor receiving said component coordinate data from said data processor for said series of exposure positions corresponding to said series of image exposures and constructing a three dimensional (3D) volumetric data set based on said series of image exposures and said component coordinate data for said series of exposure positions; and

a display displaying images based on said (3D) volumetric data set.

17. (Original) The apparatus of claim 16, said receptor further comprising at least one sensor detecting a radial position of said receptor relative to a patient surface.

18. (Original) The apparatus of claim 16, further comprising:

a first sensor attached to said source bracket sending x-ray source coordinate data to said data processor, said x-ray source coordinate data indicative of a distance between said x-ray source and said central axis; and

a second sensor attached to said receptor bracket sending receptor coordinate data to said data processor, said receptor coordinate data indicative of a distance between said receptor and said central axis.

19. (Original) The apparatus of claim 16, further comprising a control panel for setting maximum and minimum radial distances relative to said central axis for at least one of said receptor and x-ray source.

20. (Original) The apparatus of claim 16, further comprising a sensor located proximate said receptor bracket for sensing position data of at least one of said receptor and a patient relative to said central axis, said x-ray source and receptor brackets radially moving said x-ray source and receptor, respectively, based on said position data.

21. (Original) The method of claim 1, wherein said desired distance comprises a uniform distance between said x-ray source and receptor.

22. (Original) The method of claim 1, wherein said desired distance maintains a region of interest of said patient at said central axis.

23. (Original) The method of claim 1, wherein said desired distance maintains a region of interest of said patient at an isocenter of said imaging system.

24. (Original) The method of claim 1, wherein a region of interest of said patient is maintained at said central axis for said series of image exposures.

25. (Original) A medical diagnostic imaging system, comprising:

a C-arm unit having an x-ray source for generating x-rays and a receptor for obtaining image exposures from received x-rays, said C-arm unit moving said x-ray source and receptor along an image acquisition path between at least first and second exposure positions, said C-arm unit rotating about a central axis corresponding to a region of interest in a patient;

x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving said x-ray source and receptor to maintain said central axis for a series of image exposures;

an image processor collecting a series of image exposures from said receptor including at least first and second image exposures obtained while said x-ray source and receptor are located at said at least first and second exposure positions, respectively, said image processor collecting position data for multiple exposure positions corresponding to said series of image exposures, said image processor constructing a three dimensional

(3D) volumetric data set based on said series of image exposures and said position data for said multiple exposure positions; and

a display displaying images based on said 3D volumetric data set.

26. (Original) The medical diagnostic imaging system of claim 25, further comprising a tracking subsystem receiving coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, said x-ray source and receptor moving relative to said central axis based on said coordinate data while said x-ray source and receptor are located at said at least first and second exposure positions.

27. (Original) The medical diagnostic imaging system of claim 25, said receptor further comprising at least one sensor detecting a position of said receptor relative to a patient surface.

28. (Original) The medical diagnostic imaging system of claim 25, further comprising a tracking subsystem receiving coordinate data representative of a patient surface from at least one sensor mounted on said receptor, said tracking subsystem setting a receptor distance relative to said central axis based on said coordinate data.

29. (Original) A method for acquiring multiple x-ray images utilized to reconstruct a three dimensional (3D) volume of patient information, the method comprising:

rotating an x-ray source and receptor about a central axis between at least first and second scan angles, said central axis corresponding to a region of interest in a patient;

moving the x-ray source and receptor to first distances to maintain said central axis when at said first scan angle and moving the x-ray source and receptor to second distances to maintain said central axis when at said second scan angle;

acquiring at least first and second images at said at least first and second scan angles; and

constructing a three dimensional (3D) volumetric data set based on said at least first and second images.

30. (Original) The method of claim 29, the moving step further comprising detecting coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, to define said first and second distances.

31. (Original) The method of claim 29, the moving step further comprising:

determining said first distance for the receptor relative to said central axis by moving the receptor towards a patient surface until receiving a sensor signal indicating a predefined distance between the receptor and the patient surface; and

calculating said second distance for the x-ray source relative to said central axis based on said first distance for the receptor.